HDI - M
Embedded Monitor

User Manual
SH7750 (SH4) – HS7750STC01H board

Version 1.0
October 2, 1998

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Contents

1 INSTALLATION

1.1 PACKAGE CONTENTS

Documentation

- *Embedded Monitor - User Manual* (this document)
- *Hitachi Debugging Interface - User Manual*
- *Release Notes*

1.2 HARDWARE

HDI-M is supplied with the SH7750 - HS7750STC01H BOARD evaluation board. Refer to appropriate hardware package information.

1.3 SOFTWARE

HDI-M is supplied with an installation disk containing the necessary executable files, help and tutorial files for the HDI (Hitachi Debugging Interface).

Note If any of these items are missing from your package, please contact the sales agent from whom you purchased it. They will be able to help you more quickly if you have the following information to hand:

- Serial number
- Product code
- Your name, company name & address

1.4 SYSTEM REQUIREMENTS

Hardware

The typical minimum hardware configuration required installing the HDI-M with SH7750 - HS7750STC01H BOARD is as follows (Windows 95):

- IBM PC or 100% compatible with a 486 DX2 CPU.
- 16MB of memory.
- Mouse (recommended).
- VGA monitor min 256 Colour
- 6MB of free disk space.
- MS-DOS 6.0 and greater with Windows 95 (preferred)

2 DOCUMENTATION

The documentation on the board is available from the \Doc directory.

2.1 FORMAT OF DOCUMENTATION

The document has been written using MS Word 97 package. This is the only format available from HMSE. If required, it is the user's responsibility to convert to other formats.

WARNING: Some information may be destroyed or displayed incorrectly during the conversion process. HMSE accepts no responsibility on this issue.

Recovery files are provided so that the user can re-program HDI, both Little or Big Endian, into the on-board FLASH devices.

Please refer to the \Doc\Mcs7750.doc for further details.

2.2 INSTALLED FILES

The directory structure after successful installation:

HDISH4_Mcs/Doc/FIRSTME.txt (Start here)
--------same---------/Mcs7750.doc (Next here)
HDISH4_Mcs/TutMcs/BigEnd/Tutorial files for big endian systems
HDISH4_Mcs/TutMcs/LitEnd/Tutorial files for little endian systems
HDISH4_Mcs/Cpush32.dll
HDISH4_Mcs/Hdi.exe
HDISH4_Mcs/Hdi.hlp
HDISH4_Mcs/Monitor32.dll
HDISH4_Mcs/Record32.dll
HDISH4_Mcs/SH4_fb.mot
HDISH4_Mcs/SH4_fl.mot
HDISH4_Mcs/Sh7750.io
HDISH4_Mcs/Simio.dll
HDISH4_Mcs/Sysrof32.dll
HDISH4_Mcs/Tcl.hlp

Any thing less does not guarantee 100% functionality for the product

3 HARDWARE INSTALLATION

Refer to SH7750 - HS7750STC01H BOARD User's Manual & SH4 Board Operation Guide – Hardware Design Specifications

4 SOFTWARE INSTALLATION

The different software components are

HDI-M Software Installation Disk, which has: -

- *Motorola S-Record Monitor file – SH4_fb.mot (Big Endian)*
- *Motorola S-Record Monitor file – SH4_fl.mot (Little Endian)*
- *Sample tutorial code*
- *Documentation on HDI-M (this manual)*
- *HDI executable for SH4*
- *How-To file listing the download of HDI-M to target both for big and little Endian (FLASH version). Refer to section 8.2*

5 INTRODUCTION

This manual describes the functions supported by the embedded monitor for HDI. It also explains how to set up and use HDI-M to run on SH7750 evaluation board – HS7750STC01H board. The HS7750STC01H BOARD is a demonstration and evaluation tool for Hitachi SH7750 family of micro-controllers.

5.1 RELATED MANUALS

Consult these manuals for details referred here in a specific area:

1. SH7750 Series - Hardware Manual Preliminary
2. SH4 CPU Board Operation Guide
3. Hitachi Debugging Interface – User Manual

5.2 ABBREVIATIONS

In this manual, we will make a great use of the following abbreviations.

EM - Embedded Monitors
HEM - Hitachi Embedded Monitors
HDI - Hitachi Debugging Interface
HDI-M - Target embedded monitor.
HLL - High Level Language
DLL - Dynamic Link Library

5.3 FEATURES

HDI-M provides High Level Language C debugging for targets that use an embedded monitor. This document covers feature supported for SH7750 series micro-controllers. The following features are supported by HDI-M:

- Support both user mode and privileged mode.
- Real-time program execution.
- Program down load.
- Program counter breakpoints.
- Step, step-over, step-out and go functions.
- Memory scans, signature, copy, and compare functions.
- Memory set verifies, fill, verify fill, and query.
- Register set and read functions.

6 OVERVIEW

The HS7750STC01H BOARD target hardware components can be seen in the diagram below:

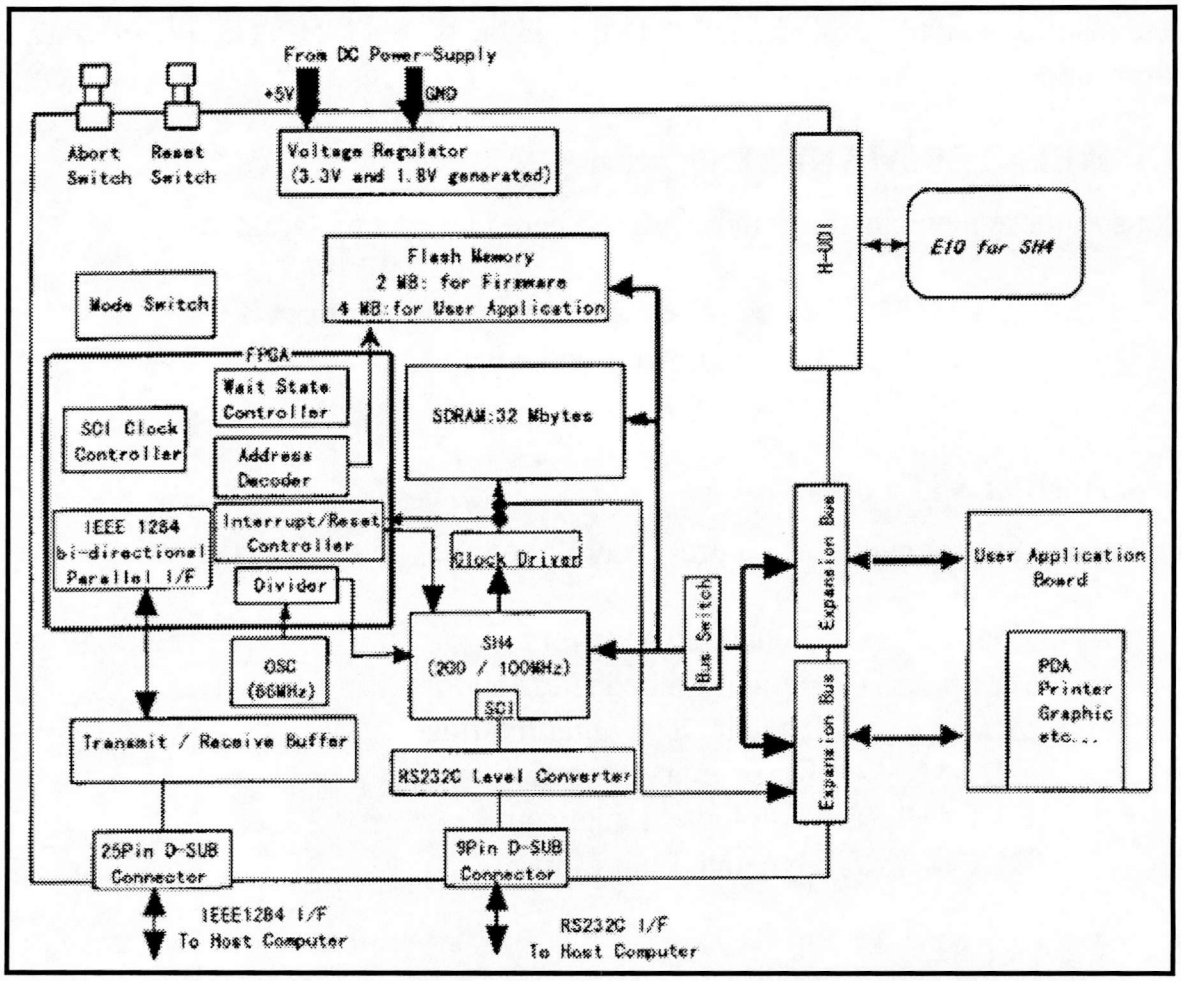


Figure 1 SH7750 - HS7750STC01H BOARD Block Diagram

The embedded monitor is programmed into the flash memory device. The HS7750STC01H BOARD has one serial port (CN1). The "Monitor Port" is used for HDI-M and the user can use the other port. The host PC running HDI-M is connected to the HS7750STC01H BOARD targets through a standard RS232 interface cable. HDI-M does not use parallel port (CN2) of the HS7750STC01H BOARD.

7 SYSTEM SPECIFICATION

7.1 MEMORY REQUIREMENTS

- Area 0: 0x00000000 - 0x03FF FFFF Firmware memory area.
- Area 3: 0x0C000000 - 0x0DFF FFFF SDRAM area.

	Area type	Bus Width	SH4 Area
1FFF FFFF 1C00 0000	Reserved area		7
1BFF FFFF 1800 0000	Expansion area		6
17FF FFFF 1400 0000	Expansion area		5
13FF FFFF 1000 0000	Expansion area		4
0FFF FFFF	Shadow of DRAM	32	3
0DFF FFFF 0DFF E000	**SDRAM-RAM (HDI-M & Monitor work area)**	64/32	3
0DFF DFFF 0C00 0000	**SDRAM-RAM (User program area)**	64/32	3
03FF FFFF 0200 0000	Expansion Area memory	32	2
01FF FFFF 0100 0000	On-board registers	32	2
00BF FFFF 0080 0000	USER Flash Area	32	1
007F FFFF 0020 0000	**NOT TO BE USED**	32	
001F FFFF 0000 0000	**HDI/MCS monitor Boot Strap loader**	32	0

Fig 2 Memory Mapping

7.2 COMMUNICATIONS

Serial Port Configuration: 38.4k, 8bit data, 1 stop bit, parity none.

8 HDI-M FOR HS7750STC01H

This particular board is able to function both as Little and Big Endian architecture. The board is capable of doing this by a selectable Jumper setting as shown in Figure in section 0.

Both version of HDI are programmed and capable of running upon the selection of J1 jumper.

If this board has already been installed with the Big and Little Endian HDI-M then please refer to section 0 for selecting and executing of HDI debugger.

8.1 PRECAUNTIONARY ADVICE

During the initial testing of the board it was discovered that the Flash sockets in which the devices sit are ***very unreliable***, tending to create an improper electrical connection.

User may find that several attempts may be required after re-sitting of these devices in their respective sockets. Author's advice is to solder these Flash devices permanently on to the board, once the initial procedure is successfully completed.

8.2 DOWNLOAD BIG \ LITTLE ENDIAN HDI-M TO FLASH

The following procedure should only be carried out in the following two circumstances:

- This is a new board and has no HDI installed to Flash.
- Flash area containing HDI has been destroyed.
- Program User area with final code

Before starting installation please check that in the directory installed for HDISH4_Mcs, there should be two Motorola Srecord files i.e. sh4_fb.mot and sh4_fl.mot. If these files are present then proceed to section 8.2.2

8.2.1 Set Board to FLASH programming mode

Connect the serial communication cable from target to PC. Ensure the following jumper settings (see table in section 8.3):

- J1 set for big endian
- J2 set for boot mode
- J7 set for 19200bps
- J8 & J9 both, set for open connection

Apply power to board. Launch HyperTerminal and establish connection to COM(x) port used between the PC and target board. The following settings should be set for the HyperTerminal:

- 19200bps
- Data 8bits
- Parity off
- Stop 1bit
- Flow control off

8.2.2 Download HDI to Flash

Pressing reset on board will initiate connection to boot mode program. The following procedure should be followed:

```
Firm Boot Loader Ver.0.1
Copyright (c) Hitachi, Ltd. 1998.
Licensed Material of Hitachi, Ltd.

Boot start ? (1:Boot start, 2:Boot end) : 1

LOAD WORK RAM CLEAR

Input endian (1:Little endian  2:Big endian) : 1

Input offset address  : 100000

Please load from host
"Select  Send Text file and send sh4_fl.mot"

FINISHED STYPE LOAD
 TOP ADDRESS = A0100000
 END ADDRESS = A01034CB

Finished Stype Load ? (Y/N) : n

Input endian (1:Little endian  2:Big endian) : 2

Input offset address  : 0

Please load from host
"Select  Send Text file and send sh4_fb.mot"

FINISHED STYPE LOAD
 TOP ADDRESS = A0010000
 END ADDRESS = A0013483

Finished Stype Load ? (Y/N) : y

LOAD RAM
      M0 : 00010000 - 0003FFFF
      M4 : 00100000 - 0013FFFF

FlashROM Clear
   1 : All blocks
   2 : exist data blocks (M0, M4)
   3 : Cancell
Input number : 2
M0 .....
M4 .....

ERACE FlashROM
      M0 : 00010000 - 0003FFFF
      M4 : 00100000 - 0013FFFF
     ...

FINISHED PROGRAM FLASH

FINISHED VERIFY OK

BOOT SUCCESSFUL

Boot start ? (1:Boot start, 2:Boot end) : 2
Please shutdown, and change short pin(J1, J2)
```

8.2.3 Download User program to FLASH (under test)

User can store and execute his program from on-board Flash devices. Flash area available to user is 4Mbytes of memory.

Connect the serial communication cable from target to PC. Ensure the following jumper settings (see table in section 8.3):

- J1 set for big or little endian
- J2 set for boot mode
- J7 set for 19200bps
- J8 & J9 both, set for open connection

Refer to section 8.2.1 for setting up the HyperTerminal. Remember here that the user program to execute from power will have to be linked for address H'00000000. The following procedure takes an example that users code to execute in Little Endian mode and program execution to begin at power up.

```
Firm Boot Loader Ver.0.1
Copyright (c) Hitachi, Ltd. 1998.
Licensed Material of Hitachi, Ltd.

Boot start ? (1:Boot start, 2:Boot end) : 1

LOAD WORK RAM CLEAR

Input endian (1:Little endian  2:Big endian) : 1

Input offset address  : TBD

Please load from host
"Select  Send Text file and  user code"

FINISHED STYPE LOAD
 TOP ADDRESS = A0800000
 END ADDRESS = ????????

Finished Stype Load ? (Y/N) : y

LOAD RAM
     TBD : 00010000 - 0003FFFF
```

```
FlashROM Clear
   1 : All blocks
   2 : exist data blocks (TBD)
   3 : Cancell

Input number : 2
TBD .....


ERACE FlashROM
     TBD : 00010000 - 0003FFFF

    ...

FINISHED PROGRAM FLASH

FINISHED VERIFY OK

BOOT SUCCESSFUL

Boot start ? (1:Boot start, 2:Boot end) : 2
Please shutdown, and change short pin(J1, J2)
```

8.3 JUMPER SETTINGS

The following table shows the default jumper settings on target board. Some settings are reserved and use of such will not guarantee successful operation of board.

Highlighted items are the default settings required for HDI to work in Big Endian mode.

No	Function	Settings		Operation
J1	Endian	1-2 Short		Little Endian
		2-3 Short		Big Endian
J2	Flash memory operating mode	Short		Boot Programming Mode
		Open		Execute start of active area
J3	Timer clock source	1-2 Short		On board clock 1.84Mhz
		2-3 Short		External clock
J4	Reserved			
J5	Reserved			
J6	Reserved			
J7	Transfer rate of the serial interface	Short		19200bps for HyperTerminal
		Open		115200bps for HyperTerminal
J8 J9	Area 0 mapping	J8	J9	
		Short	Short	Reserved
		Short	Open	H'00000000-00FFFFFF; expansion bus H'01000000-01FFFFFF; on board registers H'02000000-03FFFFFF; expansion bus
		Open	Short	H'00000000-007FFFFF; User Flash area H'01000000-01FFFFFF; on board registers H'02000000-03FFFFFF; expansion bus
		Open	Open	H'00000000-007FFFFF; Boot + HDI H'00800000-00FFFFFF; User Flash area H'01000000-01FFFFFF; on board registers H'02000000-03FFFFFF; expansion bus
J10 J11	Bus frequency	J10	J11	System bus frequency Bclk
		Short	Short	100Mhz
		Short	Open	66Mhz
		Open	Short	33Mhz
		Open	Open	Reserved
J12	Reserved	Short		Reserved
		Open		Reserved

9 MONITOR FUNCTIONS

All monitor functions are accessed through the HDI-M graphical user interface they cannot be accessed by user commands.

9.1 PROGRAM DOWNLOAD

Supports object code format

- SYSROF V2.0 objects code for C source level debugging sessions.
- Motorola S-record object code

9.2 PROGRAM COUNTER BREAKPOINT

Software breakpoints (max. 10 point) are supported only. Monitor uses TRAPA instruction to set the breakpoints in the RAM area. Breakpoints can not be set in the delayed slot OR in User program in Flash area.

9.3 EXECUTION FUNCTIONS

HDI-M supports real time program execution on SH7750 - HS7750STC01H BOARD target hardware. The different execution modes provided are:

- Execution program from current PC.
- STOP program with the STOP button.
- STOP program because of breakpoint occurrence.
- STEP functions (step-in, step-out, step-over).

9.4 MEMORY FUNCTION

- General memory set functions.
- byte memory set
- memory query
- byte memory get
- fill, verify and verify fill
- scan, calculate signature

9.5 REGISTER FUNCTIONS

- Request of register block values
- Request of single register value
- Set register block values
- Set single register value

9.6 OTHER FUNCTIONS

Further commands supported perform:

- Definition of Monitor capabilities
- Limited Map functions support

10 HDI-M RESTRICTIONS

In general monitor based debugging tools are intrusive. This is because they are resident to the target hardware and use CPU resources.

10.1 INTERRUPTS AND EXCEPTIONS

The monitor provides interrupt handlers for most interrupt sources. However, if the user wishes to modify them it is important that the following handlers are preserved to retain the monitor functionality while executing user code.

1. SCI (ERI, RxI, TxI, TEI) - Serial Communication Interface
2. UBC - User Break Controller.
3. TRAPA #255 - Trap instruction.

The following interrupts and exceptions are required to support the HDI-M status bar.

1. Address error
2. Illegal general instruction
3. Illegal slot instruction
4. NMI

If required by the user, they can be redefined view corrupting the monitor.

10.2 INTERRUPT MASK LEVEL

SCI interrupt level which is used by Monitor is level 15 (0xF). If user program needs to use other interrupts, they have to have lower interrupted level than SCI. Don't mask SCI's interrupt level in the user program. Mask level must be smaller than B'1110.

10.3 ENABLE APPLICATION INTERRUPTS

The Monitors installs interrupts in the ROM area. Consequently, when the hardware is booted first the monitor program is executed first. If the user wants to install his, own interrupts he needs to follow the procedure described here.

1. Define Application interrupt vector table and service routine in User RAM area.
2. VBR register must be set by the application initialisation code to start of vector table.

3. The embedded monitor interrupt handlers must be entered in the application vector table.

Example provides the address definition of the interrupts and exceptions, which need to be called by the user program.

```
SYMBOL NAME                    ADDR

HDI_UBC                        H'A0001000
HDI_BREAK                      H'A0001020
HDI_ILGL_INST                  H'A0001040
HDI_ILGL_SLOT                  H'A0001060
HDI_CPU_ADRS                   H'A0001080
HDI_DMA_ADRS                   H'A00010A0
HDI_NMI                        H'A00010C0
HDI_SCI_RX                     H'A00010E0
HDI_SCI_ERR                    H'A0001100

TRAP        .EQU    H'FF000020
EXPEVT      .EQU    H'FF000024
INTEVT      .EQU    H'FF000028
```

Table 1. HDI exception/interrupt handler

Label	Exception Event	Exception code	Function	User program calls this…
HDI_BREAK	**TRAPA instruction**	**0x160**	**PC breakpoint**	**MUST**
HDI_CPU_ADRS	Address error (load/store)	0x0E0 0x100	Error message	Optional
HDI_DMA_ADRS	-	-	Error message	-
HDI_ILGL_INST	Reserved instruction code	0x180	Error message	Optional
HDI_ILGL_SLOT	Illegal slot instruction	0x1A0	Error message	Optional
HDI_SCI_ERR	**SCI Receive Error**	**0x4E0**	**Error message**	**MUST**
HDI_SCI_RX	**SCI Receive data full**	**0x500**	**STOP button**	**MUST**
HDI_UBC	**User breakpoint trap**	**0x1E0**	**Step**	**MUST**

User program should use following procedure to handle the interrupts and exceptions.

(1) Store R1 to stack (only necessary if working registers required)
(2) Store R0 to stack (only necessary if working registers required)
(3) Read EXPEVT or INTEVT to check the exception cause
(4) If cause is used by user program, exception service routine should be here.
(5) Store SSR to stack
(6) Store SPC to stack
(7) User interrupts code

(8) Clear block bit of SR
(9) Restore SPC from stack
(10) Restore SSR from stack
(11) Restore R0 from stack
(12) Restore R1 from stack
(13) Return from exception by RTE

Procedure (5) to (11) must be executed when user needs to step or break his interrupt code.

Note:
Breakpoint can only be set at the procedure (8) in the interrupt service routine. If breakpoint is set before SR.BL of status register is cleared, reset exception will occur by SH7750 hardware. Exception must not occur when SR.BL=1.

11 REGISTERS

11.1 SSR AND SPC REGISTER

These registers value are not guaranteed. Modification of values on the register window does not affect user program. HDI will each time save the user contents to stack and restore correct settings.

11.2 PERIPHERAL I/O REGISTER

Following I/O the monitor initialises registers.

Table 2. Peripheral I/O register setting

Module	Register	Address	Default value	Monitor setting Big Endian/Little Endian
CPG	FRQCR	0XFFC0 0000	HOLD	0x0E0A
BSC	BCR1	0XFF80 0000	0x0000	0x00080008
	BCR2	0XFF80 0004	0x3FFC	0xC000
	WCR1	0XFF80 0008	0x3FF3	0x37773773
	WCR2	0XFF80 000C	0xFFFF	0xFFFE6FEF
	WCR3	0XFF800010	0xFFFF	0x07777774
	MCR	0XFF80 0014	0x0000	0x080A6214
	RTCOR	0XFF80 0024	0x0000	0xA503
	RTCSR	0XFF80 001C	0x0000	0xA58C
INTC	IPRA	0XFFD00004	0x0000	0x0000
	IPRB	0XFFD0 000C	0x0000	0x00F0
	IPRC	0XFFD0000C	0x0000	0x0000
UBC	BBRA	0XFF20 0008	0x0000	0x0000
	BAMRA	0XFF20 0004	-	0x00
SCI	SCSMR	0XFFE0 0018	0x00	0x00
	SCBRR	0XFFE0 0004	0xFF	0x28
	SCSCR	0XFFE8 0008	0x00	0x30

12 TUTORIAL

This section of the manual will guide you through an example debugging session and show the major features that HDI-M provides.

When you have completed this tutorial, you will be able to perform most operations necessary to debug your application.

For a complete description of all the standard features available, refer to main HDI - User Manual.

12.1 STARTING HDI

To invoke HDI from the program manager click on the HDI icon and select the **[File->Open...]** menu items. Alternatively, double click the HDI icon.

12.2 SELECTING THE TARGET

The HDI is designed such that it supports numerous "platforms" the "SH4 Monitor" being one of them.

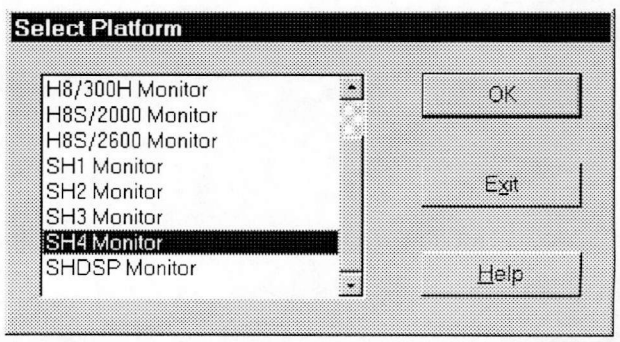
When invoking HDI for the first time the software will automatically prompt you to choose a "platform" for the current session.

From the HDI menu select **[Setup->Select Platform...]** menu item.

You will be asked to choose a platform from the list of installed targets, choose "SH4 Monitor" and click OK.

When the "SH4 Monitor" Platform module has been successfully started the message "Link Up" appears on the Status bar.

Note If only one target is installed this menu item will not be selectable and HDI will default to this target when invoked.

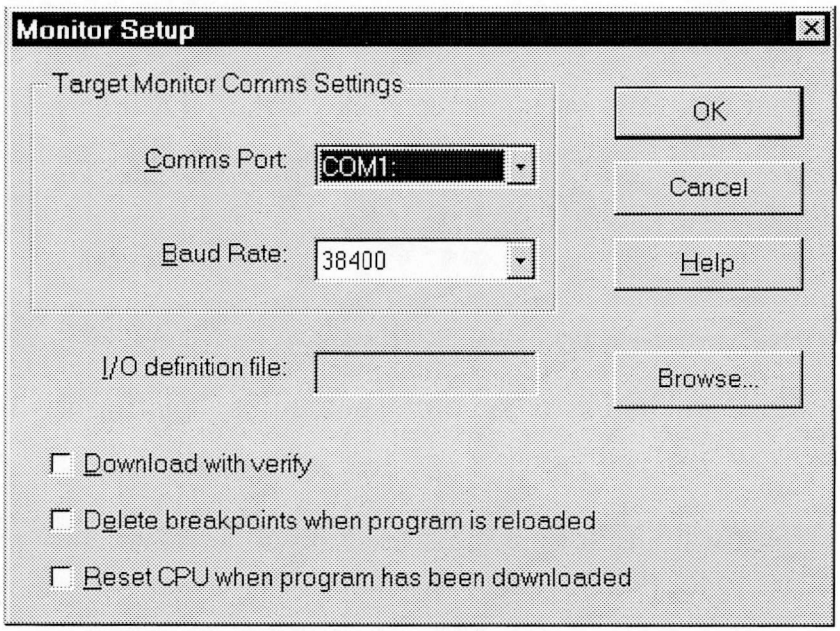


12.3 CONFIGURING THE SH4 MONITOR

The monitor program installed on the HS7750STC01H BOARD target hardware is configured as follow:

Serial communication: 38.4k baud rate, 8 bit data, 1 bit stop, parity none, flow control Xon/Xoff.

In case the link is not established, HDI will display the "Monitor Setup" dialog.



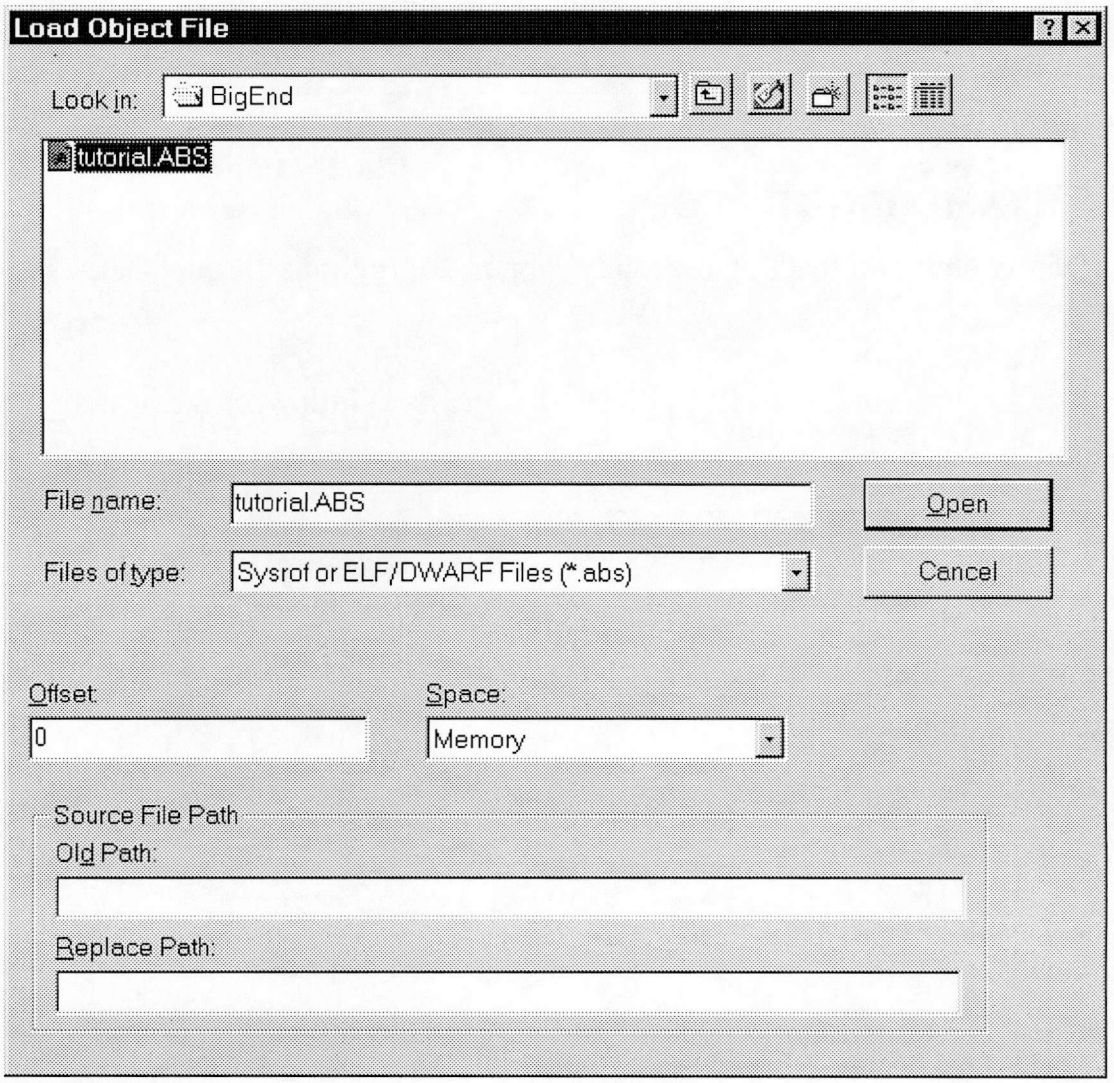
If you cure the link failure (loose cable, no power supply, wrong port etc.) pressing the "**OK**" should successfully initialise HDI-M.

12.4 DOWNLOADING THE TUTORIAL PROGRAM

Select the **[File->Load Program...]** and browse through the directories to where you have installed your tutorial program.

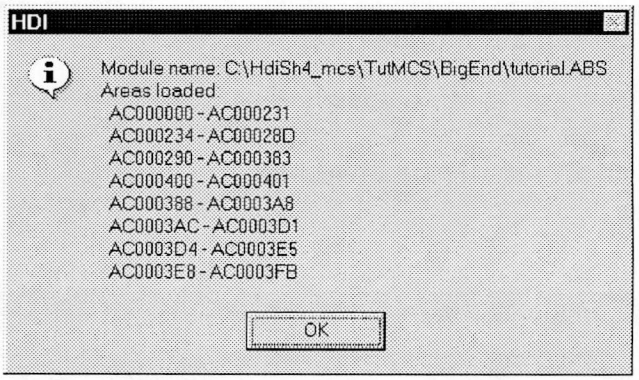
You should see the following dialogue box:

Select the file **tutorial.abs** and click OK.



While the file is loading the status bar indicates a percentage of how much of the file has been loaded. When HDI has finished loading the file it will show the location of the file, the range of addresses that were loaded and the dialog will show:

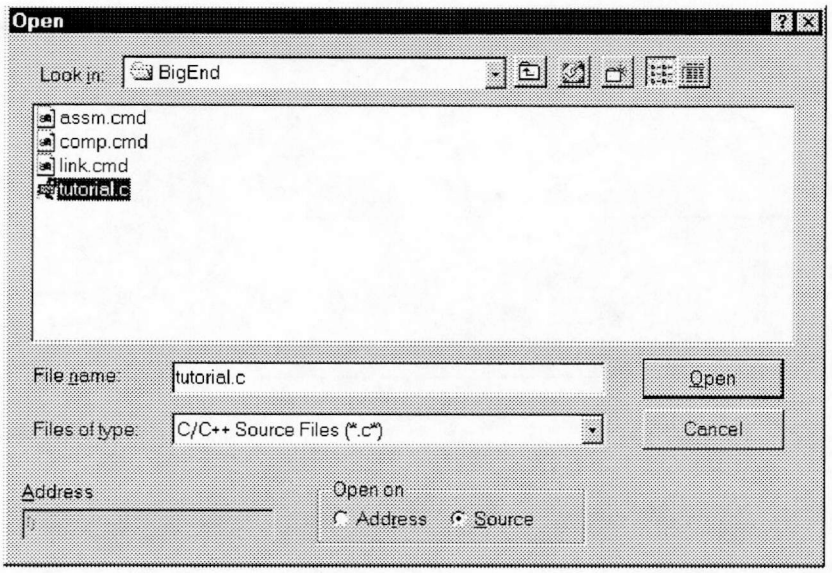
Click OK to continue.



12.5 EXAMINING THE CODE

You can examine both C or assembly language programs through HDI display windows.

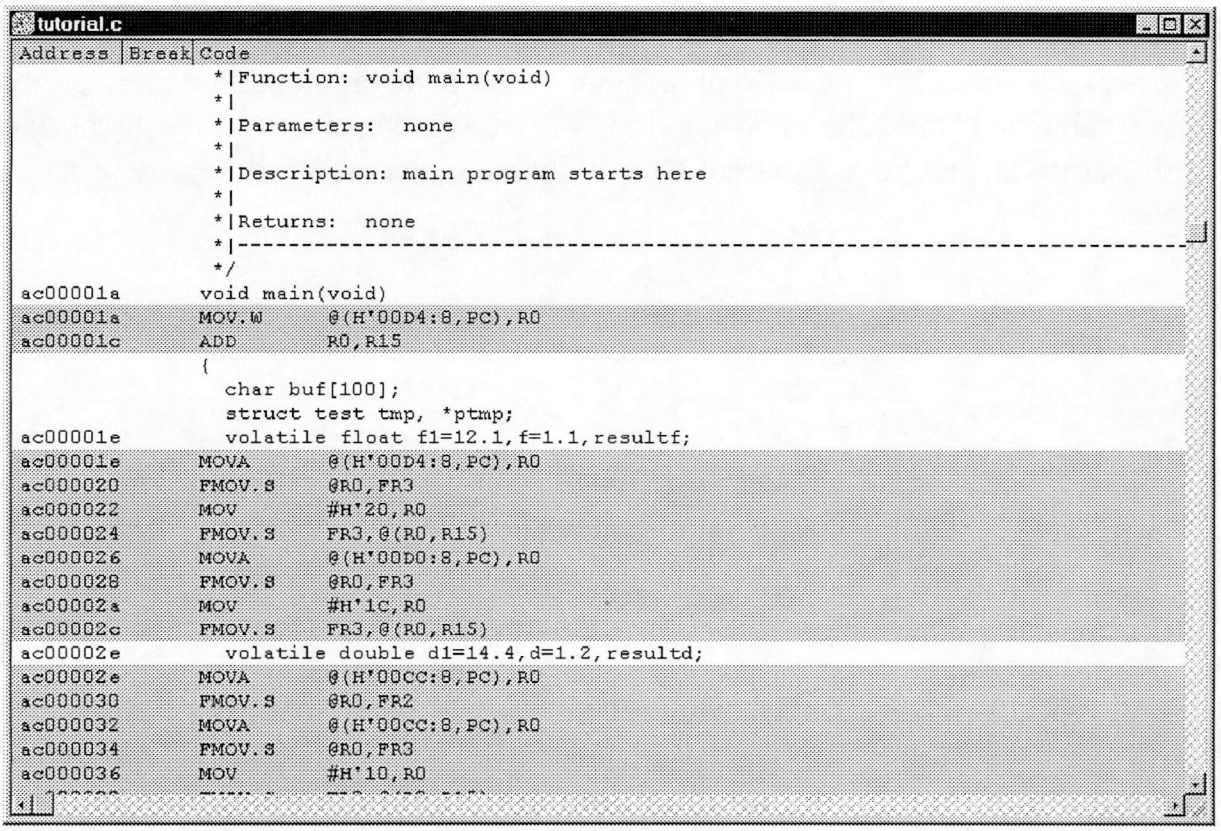
Viewing the program - Select **[View->Program Window...]** menu item or use the toolbar icon  .



Now select the **tutorial.c** file in the same directory as **tutorial.abs**.
Click Open.

12.6 CHANGING THE PROGRAM DISPLAY

The code window can display source level, mixed source and assembly code or purely assembly code. To interchange between these display modes, click the right mouse button with the arrow over the code window and select either Source / Mixed / Assembler. Try changing between these now. A mixed mode display will be seen in the code window display.



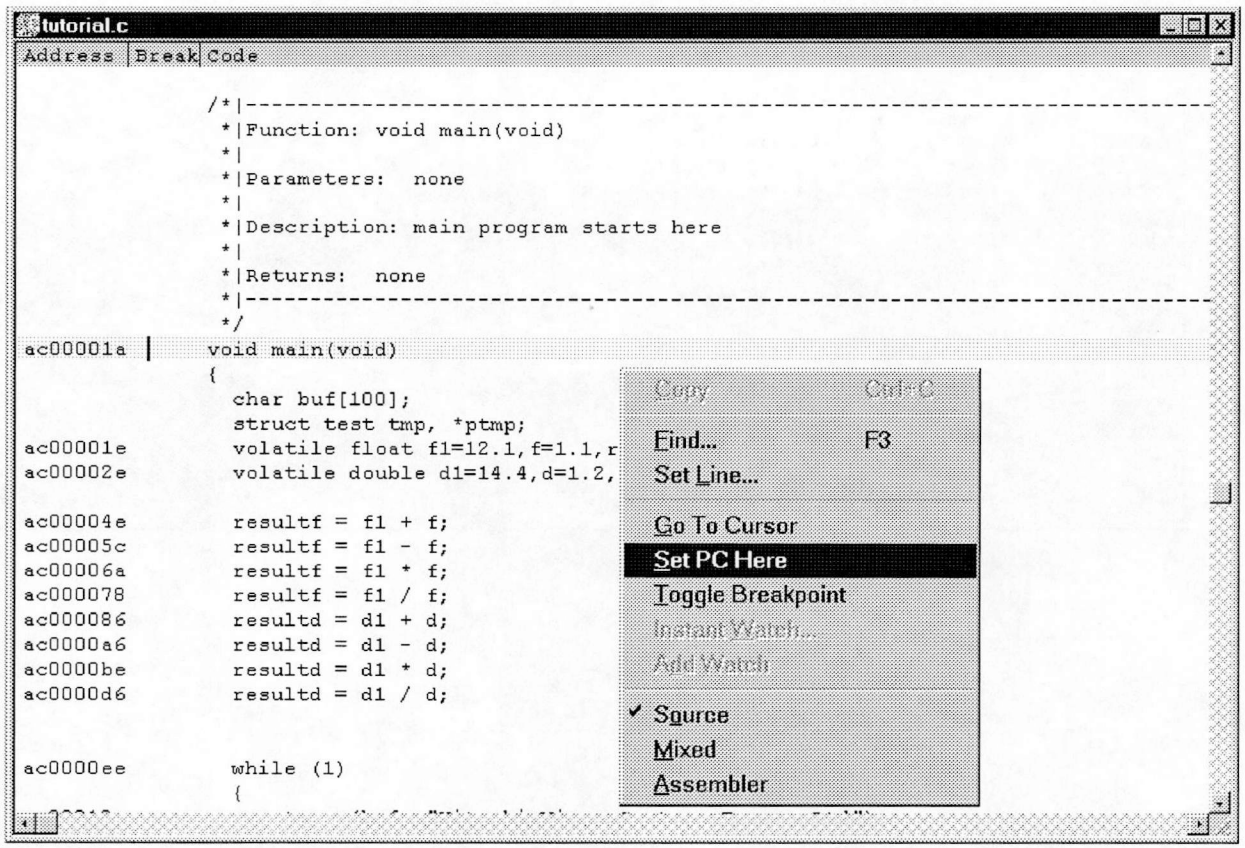
12.7 SETTING A PROGRAM COUNTER BREAKPOINT

Now find the *main()* function using the vertical scroll bars on the right of the window so that you can set a Program Counter (PC) breakpoint on this function.

There are two different ways to set a breakpoint on this function.

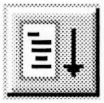
- Double clicking in the break column of the code window.
- Left click the function and using the right mouse button select the toggle breakpoint menu item.

We will double click on the Break column of the **tutorial.c** code window on the *main()* function line. The code window will now indicate that a PC break has been set on this address. Program Counter breakpoints are used to stop program execution.

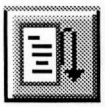


12.8 RUNNING A PROGRAM

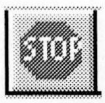
To start program execution open assembly file uservec.src. Set the mouse cursor to the line immediately after the label "ENTRY" and set the PC using the right mouse menu option "Set PC Here" as seen in the dialogue below.



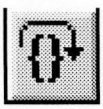
To start program execution select **[Run->Go], F5** function key or use the Go toolbar.



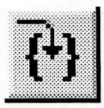
To start program execution from Reset condition (You should have all the start up code set-up) select **[Run->Go Reset], Shift+F5** function key or use the Go toolbar.



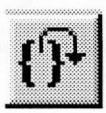
When user program is executing the status bar indicates "Go". To stop program execution select the **[Run->Halt Program]** menu item or use the toolbar icon.



Stepping over a function - To step over a C function select **[Run->Step Over]** menu item or the toolbar icon.



Stepping out a function - To step into a C function select **[Run->Step Out]** menu item or use the toolbar icon.



Stepping into a function - To step into a C function select **[Run->Step In]** menu item or use the toolbar icon

12.9 WATCH WINDOW

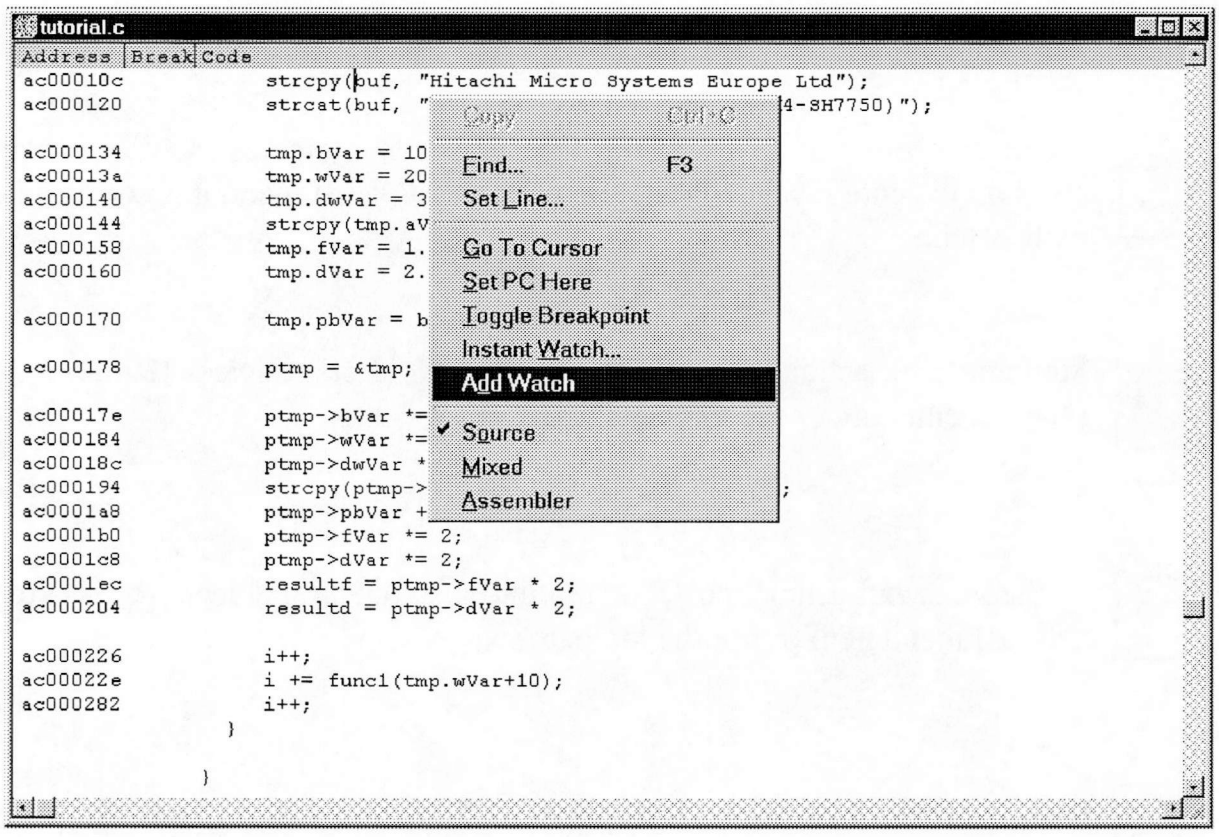
Watch windows are normally used for viewing program variables. A Watch window can be opened by selecting **[View->Watch Window]** menu item or use toolbar icon  if you have previously added this to the toolbar.

12.9.1 Looking at variables

There are two methods of adding variables to the watch window.

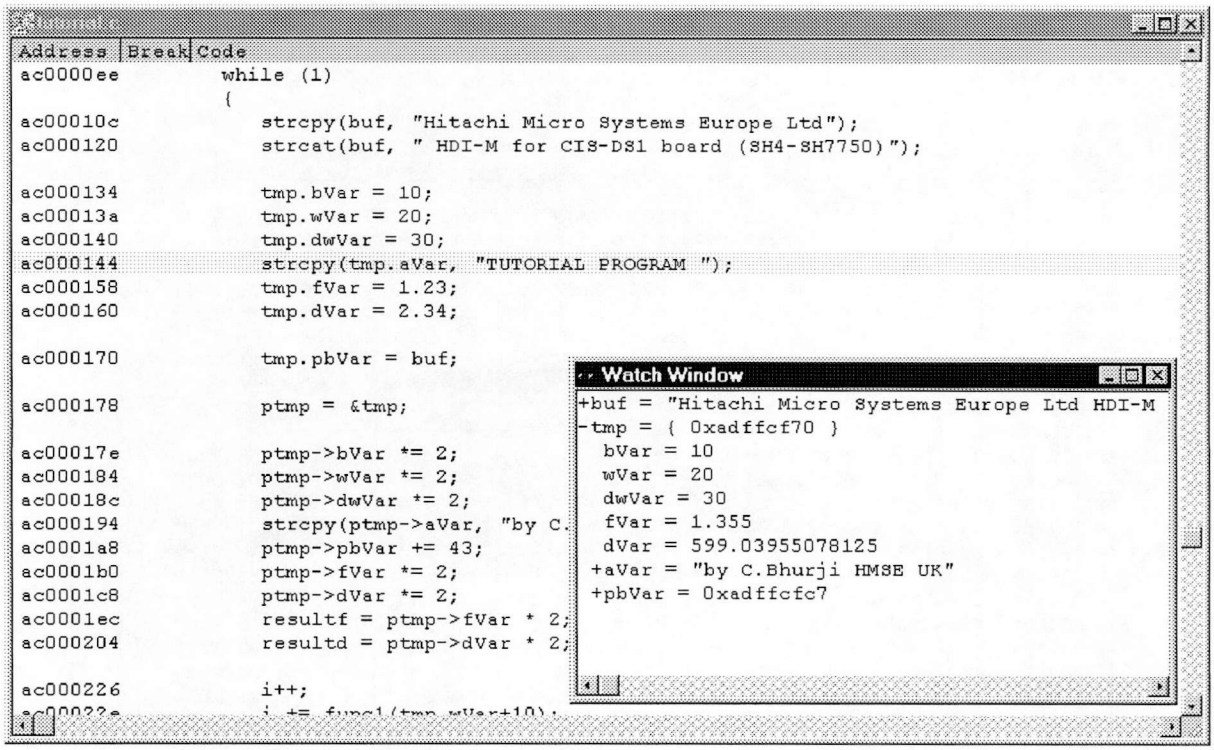
1. Click the left button on the desired variable and press the right button. Then select **Add Watch** button from the pop-up window menu.

2. Place the mouse cursor over the watch window and press the right mouse button. Then select **Add Watch** button from the pop-up window menu.



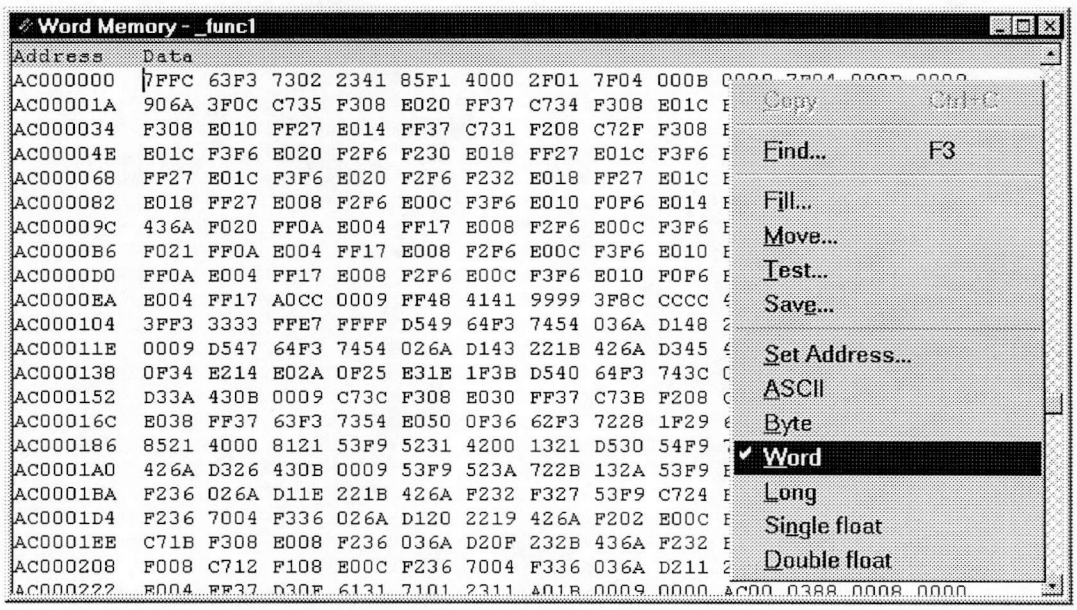
A typical use of the Watch Window can be seen below, where the tmp variables

can be monitored by HDI at program execution.



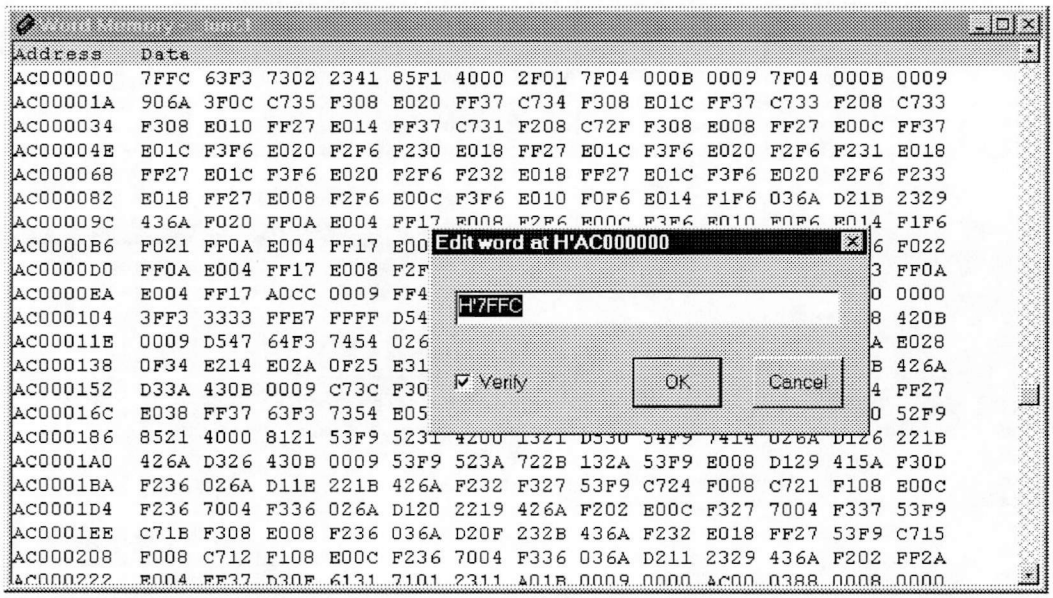
12.9.2 Looking at memory

A memory window can be opened by selecting **[View->Memory Window]** menu item or use toolbar icon  . The dialog shown below will be displayed:



The Address entry can be either a pure address or a symbol. A typical memory window with the data grouped as bytes and displayed as hex values will be as follows:

Memory windows are editable. To edit the data just place the mouse cursor over the value you want to change click the left mouse and type the new value in.

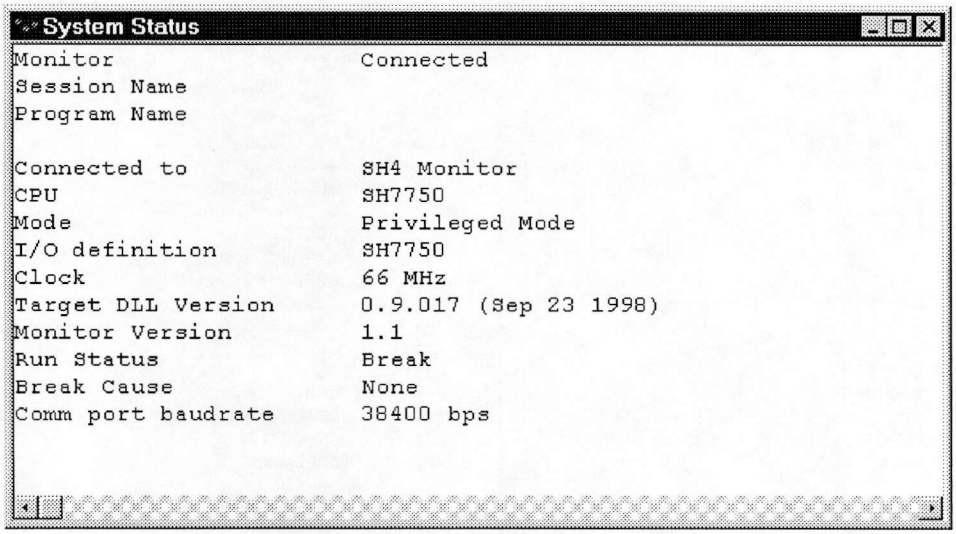


12.10 WHAT ELSE IS THERE?

The main windows not visited so far include the status and register windows.

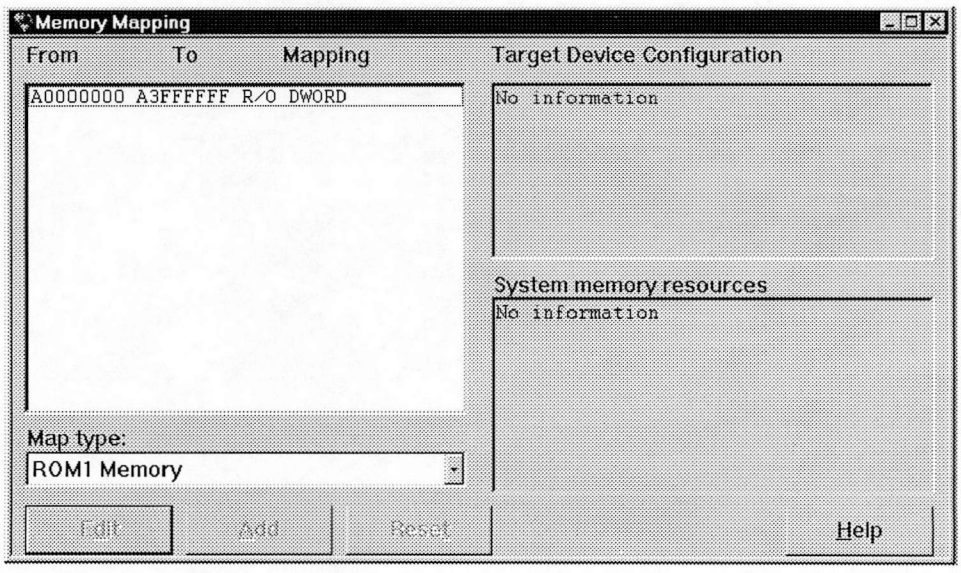
12.10.1 Status Window

The status window details current setting for mode, device, session, target signals and run-time to mention a few. Open this window by selecting the **[View->StatusWindow...]** menu item or use toolbar icon  .



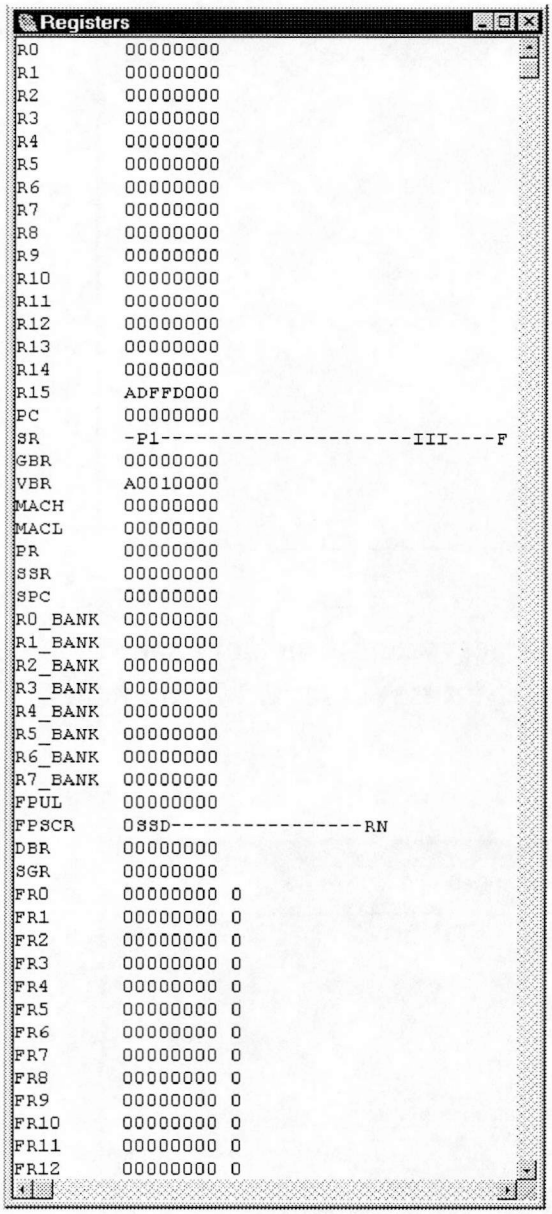
12.10.2 Memory Window

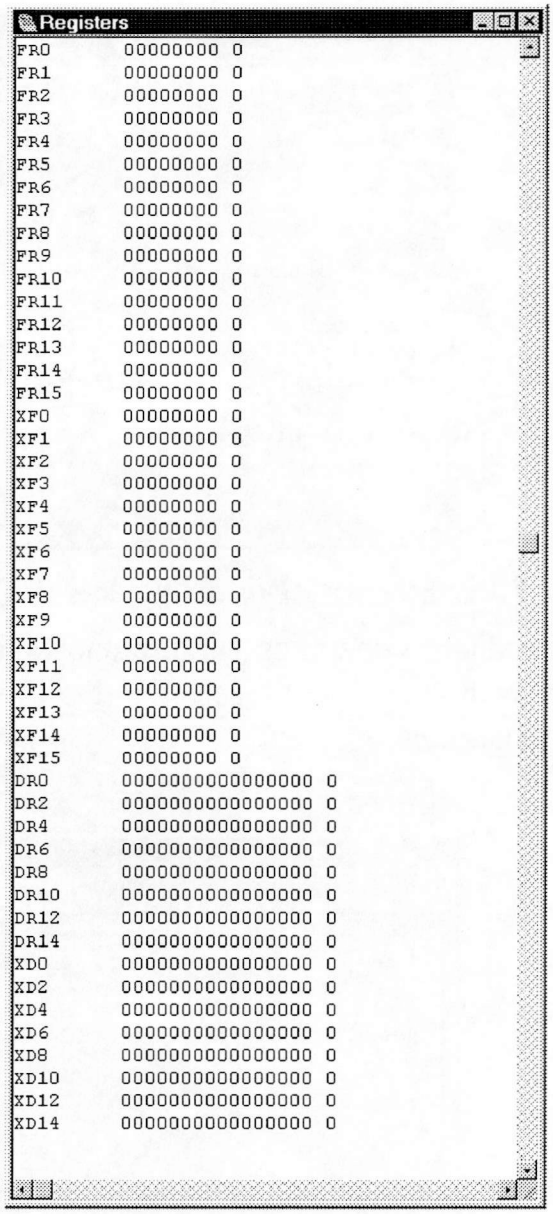
The memory-mapping window shows the target system's memory and resources. Open this window by selecting the **[View->StatusWindow...]** menu item or use toolbar icon 



12.11 REGISTER

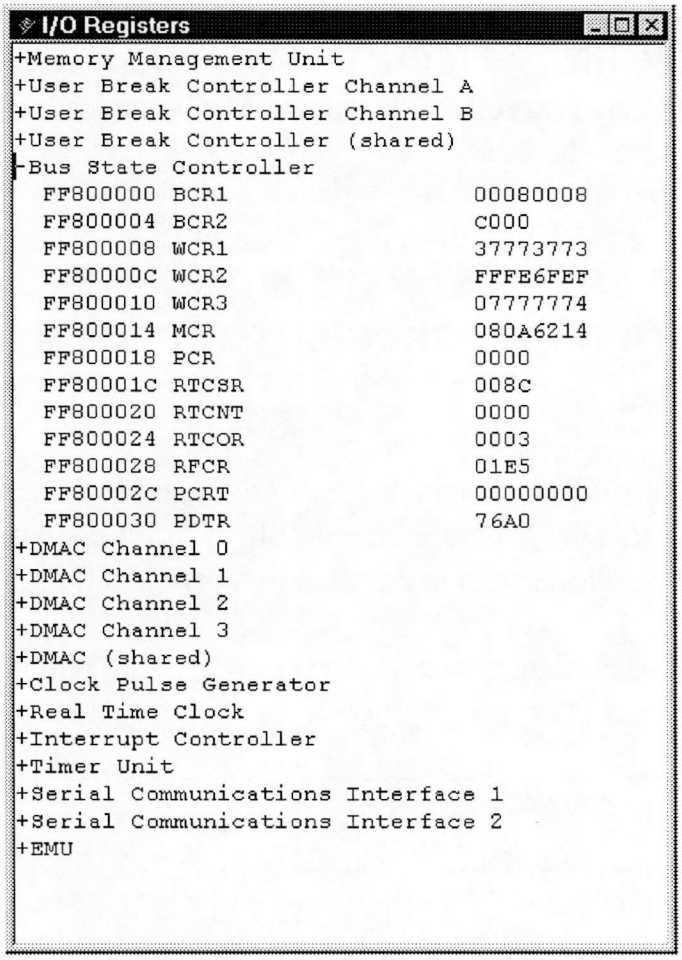
Contents of the CPU's registers can be viewed and amended using this window. It operates in a similar fashion to the memory window. Open this window by selecting the **[View->Register Window...]** menu item or use toolbar icon  .





12.12 I/O REGISTER

Contents of the I/O registers can be viewed and amended using this window. It operates in a similar fashion to the register window. Open this window by selecting the **[View->I/O Register Window...]** menu item.



12.13 9.14 SUMMARY

The majority of HDI-M features have been demonstrated in this tutorial. You should now be in a position to use this product to develop your own embedded applications.

13 TROUBLESHOOTING

13.1 HDI-M DOESN'T LINK-UP TO THE MONITOR PROGRAM.

(Measures)
Please make sure the connection between PC and target hardware HS7750STC01H BOARD. In the initialisation routine of the monitor, it beeps using speaker of the HS7750STC01H BOARD. If you can not hear this, monitor pogrom is not working correctly. Please check whether voltage is good enough or correct EPROM on the board.

13.2 HDI-M'S STATUS BAR SAYS 'GENERAL ILLEGAL INSTRUCTION' AND PROGRAM DOESN'T RUN.

(Measures)
The illegal general instruction occurs when privileged instruction is executed in the user mode. In this case, please change SR to privileged mode on the register window. HDI-M supports both user mode and privileged mode debugging.

By the Reset CPU command **[Run -> Reset CPU]**, you can also change registers value as follows:-

Register	Value by Reset CPU	Note
PC	0xAC00 0000	RAM start address (Not same as real chip)
SR	0x6000 00E0	Privileged more, Interrupt mask is B'1110
R15(SP)	0xAC0F F000	User program area end address (Not same as real chip)
VBR	0x0000 0000	same as real chip

13.3 'CAN NOT SET BREAKPOINT AT THE SPECIFIC ADDRESS' ERROR OCCURS WHEN BREAKPOINT IS SET.

(Measures)
You can not set breakpoint at the delayed slot.

13.4 HDI-M DOESN'T BREAK IN THE INTERRUPT SERVICE ROUTINE.

(Measures)
If you need to put the breakpoint at the interrupt service routine, this routine should be written according to this restriction. If you need more information please refer section 4 "HDI-M Restrictions - Enable Application Interrupts" and sample program USERVEC2.SRC.

13.5 IN THE MEMORY WINDOW, I/O REGISTER VALUES ARE NOT CORRECTLY DISPLAYED.

(Measures)
Memory window is using a single byte access when word data or long word data are accessed. Therefore, the value of the I/O register on the memory window is not correct if register is not accessible with 8-bit. Please use I/O register window instead.

13.6 STEP EXECUTION SPEED IS SLOW.

(Measures)
If watch window and I/O register window are opened, these windows try to read the data every step execution time. If you feel that step execution speed is slow, we recommend to minimise these windows during step execution.

14 MENUS AND WINDOWS

No specific target windows are supported by HDI-M. Further information on commands and the general HDI functions can be found in the "Hitachi Debugging Interface - User Manual".

15 APPENDIX A - ASCII CODE TABLE

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b 4	**b 3**	**b 2**	**b 1**	**MSB/ LSB**	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DCO	SP	0	@	P	‘	P
0	0	0	1	1	SOM	X-ON	!	1	A	Q	a	q
0	0	1	0	2	EOA	TAPE	"	2	B	R	b	r
0	0	1	1	3	EOM	X-OFF	#	3	C	S	c	s
0	1	0	0	4	EOT		$	4	D	T	d	t
0	1	0	1	5	WRU	ERROR	%	5	E	U	e	u
0	1	1	0	6	RU	SYNC	&	6	F	V	f	v
0	1	1	1	7	BEL	LEM	’	7	G	W	g	w
1	0	0	0	8	FE0	CAN	(	8	H	X	h	x
1	0	0	1	9	TAB	S1	)	9	I	Y	i	y
1	0	1	0	A	LF	EOF	*	:	J	Z	j	z
1	0	1	1	B	VT	ESC	+	;	K	{	k	{
1	1	0	0	C	FF	S4	,	<	L	\	l	|
1	1	0	1	d	CR	S5	-	=	M	}	m	}
1	1	1	0	E	SO	S6	.	>	N	^	n	~
1	1	1	1	F	SI	S7	/	?	0	-	o	RUB OUT

16 INDEX

T

U

V

W